4 Troubleshooting

This troubleshooting guide gives instructions for identifying and correcting malfunctions and responding to alarms. Refer to Section 7 if a part needs to be replaced and Figure 1 in Section 7 (page 5) for location of connectors and pins.

Caution

REFER ALL SERVICING TO QUALIFIED PERSONNEL.

AEM Monitor (Monopolar)

Situation	Possible Cause	Recommended Action
The Power On Self Test function (POST) did not take place when power was turned ON. **All** indicators including the power ON are not on, and no beeps are heard.	Disconnected power cord, faulty wall receptacle, or faulty power cord.	Check the power cord connections (monitor and wall receptacle). Connect the power cord to a functional wall receptacle. If necessary replace the power cord.
	Fuse drawer is open or fuses are blown.	Open the fuse drawer. Check the fuses and replace, if necessary, with 0.5 A, 5 X 20 mm fuse. Install the fuse drawer.
	Malfunctioning power entry module or connections.	Check the power entry module and its cable connections, if faulty, contact service center.
	Malfunctioning power switch.	Test switch, if faulty, replace power switch.
	Malfunctioning AC Power cable (in chassis).	Measure line voltage at input terminals on J1 of power supply. If the line voltage is not present, replace AC power cable.
	Malfunctioning power supply.	Check the power supply's output voltages at power supply's J2: Pins 2 and 4 are ground; Pin 1, + 15.0 ±.1V; Pin 3, +5.27 ±.05V; Pin 5, -15.0 ± .1V. If any voltage is incorrect, adjust or replace the power supply.
	Internal cables loose, disconnected, or malfunctioning.	Check and reseat all internal connections. Turn on and measure the power supply voltages at J4 on the ESM Main Board. If any voltage is incorrect, replace the DC power cable.

Situation	Possible Cause	Recommended Action
The self test function (POST) did not take place when power was turned on. Power ***On*** indicator is on.	Malfunctioning power supply.	Check the power supply's output voltages at power supply's J2: Pins 2 and 4 are ground; Pin 1, + 15.0 ±.1V; Pin 3, +5.27 ±.05V; Pin 5, -15.0 ± .1V. If any voltage is incorrect, adjust or replace the power supply.
	Internal cables loose, disconnected, or malfunctioning.	Check and reseat all internal connections. Turn on and measure the power supply voltages at J4 on the ESM Main Board. If any voltage is incorrect, replace the DC power cable.
	Front Panel malfunction.	Remove the front panel connection to the ESM Main Board at J2 and replace with an unmounted ESM Display Board. If all indicators function, replace the front panel.
	ESM Main Board malfunction.	Turn the power switch ***Off*** for 30 seconds, then turn ***On***. If the problem persists, replace the ESM Main Board.
Electrosurgical generator remains in alarm state. ***AEM Cord*** indicator is on.	Poor connection of the cord to the shield or Active Electrode Monitor.	Disconnect and reconnect the cord connection to the instrument and the cord connection to the Active Electrode Monitor .
	Malfunctioning cord.	Connect the cord to the instrument, put the probes of an ohm meter to the pin sockets in the Active Electrode Monitor AEM cord connector. If the resistance is >4 Ohms, replace the cord.
	Malfunctioning connection to ESM Main Board.	Short the pins in the ***AEM Cord*** receptacle (on the front panel). If the indicator doesn't go out, remove the cover and short pins 1 & 2 of J1. If the indicator goes out, replace the shield connector assembly.

Situation	Possible Cause	Recommended Action
continued...	Malfunctioning ESM Main Board.	Remove the front panel connection to the ESM Main Board at J2 and connect a voltmeter shunted with 1K ohms to the +15V supply (+ end of C47) and pin U2-16. The voltage should be >14V initially, and <1V when pins 1 & 2 are shorted. If this does not happen, replace the ESM Main Board.
	Malfunctioning ESM Display Board.	Remove the front panel connection to the ESM Main Board at J2 and replace with an unmounted ESM Display Board. If the ***AEM Cord*** indicator lights correctly, replace the ESM display board.
Electrosurgical generator remains in alarm state. ***Return Electrode*** indicator is on.	Improper return electrode.	Must use a dual-pad return electrode. Verify that the return electrode connector has a pin projecting from the end.
	Dual Electrode pin is not being detected.	Remove the return electrode connector from the adapter and reinsert fully into the adapter. If the ***Return Electrode*** indicator goes out, unit is OK. If not, wiggle the return electrode connector in the direction of smallest dimension. If the indicator goes out only momentarily, replace the adapter assembly.
	Malfunctioning connection to ESM Main Board.	Remove the cover and short pins 3 & 4 of J1. If the indicator goes out, replace the adapter assembly.

Situation	Possible Cause	Recommended Action
continued...	Defective ESM Main Board.	Remove the front panel connection to the ESM board at J2 and connect a voltmeter shunted with 1K ohms to the +15V supply (+ end of C47) and pin U2-15. The voltage should be >14V initially, and <1V when pins 3 & 4 are shorted. If this does not happen, replace the ESM Main Board.
	Defective ESM Display Board.	Remove the front panel connection to the ESM Main Board at J2 and replace with an unmounted ESM Display Board. If the ***Return Electrode*** indicator lights correctly, replace the ESM display board.
Electrosurgical generator remains in alarm state. Both ***Return Electrode*** and ***AEM Cord*** indicators are on.	See possible causes for both "***Return Electrode*** indicator is on" and "***AEM Cord*** indicator is on."	See recommended action for both "***Return Electrode*** indicator is on" and "***AEM Cord*** indicator is on."

Situation	Possible Cause	Recommended Action
Electrosurgical generator remains in alarm state. ***Ready*** indicator is on and all fault indicators are off.	Electrosurgical generator in alert state.	Reset the electrosurgical generator contact quality monitor.
	Dual pad open or short circuited.	Install dual pad so that correct resistance is seen by the electrosurgical generator.
	Poor connection in return electrode circuit.	Disconnect and reconnect return electrode connection to the adapter and the adapter connection to the electrosurgical generator.
	Malfunctioning electrosurgical generator.	Plug the return electrode connector directly into the electrosurgical generator. If the electrosurgical generator still shows an alarm status, replace the electrosurgical generator.
	Malfunctioning connection to ESM Main Board.	Short pins on either side of the Adapter (only 1 short). Measure the resistance between the corresponding pins on the other side. If >2 ohms, add short between pins 5 & 6 of J1. If still > 2 ohms, return the unit for repair.
	Malfunctioning ESM Main Board.	Remove all connections to the adapter, and measure the resistance between pins 5 & 6 of J1. If >2 ohms, replace ESM Board.

Situation	Possible Cause	Recommended Action
Electrosurgical generator not in alert state during fault. The ***Ready*** indicator is off, and any of the following indicators are also on: ***AEM Cord***, ***Return Electrode***, or ***Insulation***.	Inappropriate internal state of the AEM Monitor.	Turn power switch ***Off*** for 30 seconds, then ***On***. Retry operation. If the ***Ready*** indicator is still inappropriately lighted, continue with tests.
	Malfunctioning electrosurgical generator.	Remove the adapter from the electrosurgical generator, if it does not go into a contact quality alert, replace the electrosurgical generator.
	Malfunctioning ESM Display Board.	Remove front panel connection to the ESM Main Board at J2 and replace with an unmounted ESM Display board. If the ***Ready*** indicator is off, replace the ESM display board.
	Malfunctioning connection to ESM Main Board.	Remove the adapter from the ESU, disconnect P1 from J1 and measure the resistance between pins 5 & 6 of P1. If < 2 ohms, replace the adapter assembly.
	Defective ESM Main Board.	Disconnect P1 from J1 and measure the resistance between pins 5 & 6 of J1. If < 2 ohms, replace the ESM Main Board.

Situation	Possible Cause	Recommended Action
AEM Monitor does not detect operative fault. ***Insulation*** light remains off during fault condition.	Arc detector failure.	Setup the AEM Monitor with the electrosurgical generator in the normal manner, using a pencil electrode. Instead of connecting the AEM cord end to an AEM instrument, put on an alligator clip that shorts both pins. Set the electrosurgical generator to 20 watts, coag. The system should turn on with no faults indicated. Activate the coag output and carefully move the pencil's blade to the alligator clip until an arc is seen. If the AEM Monitor fails to light the ***Insulation*** indicator and deactivate the electrosurgical generator, replace the ESM Main Board.
	Short detector failure.	Same setup as before. Hold the pencil's blade against the alligator clip, then activate the electrosurgical generator. If the AEM Monitor fails to light the ***Insulation*** indicator and deactivate the electrosurgical generator, replace the ESM Main Board.
Blown fuse(s) on power supply.	Unknown	Replace power supply. **DO NOT REPLACE FUSES**

End Point Monitor (Bipolar)

Situation	Possible Cause	Recommended Action
When the power was turned ON, **all** indicators including the power ON are not on, and no beeps are heard.	Disconnected power cord, faulty wall receptacle, or malfunctioning power cord.	Check the power cord connections (Monitor and wall receptacle). Connect the power cord to a functional wall receptacle. If necessary replace the power cord.
	Fuse drawer is open or fuses are blown.	Open the fuse drawer. Check the fuses and replace, if necessary, with 0.5A, 5 X 20 mm fuse. Install the fuse drawer.
	Malfunctioning power entry module or connections.	Check the power entry module and its cable connections, if faulty, repair or replace the power entry module.
	Malfunctioning power switch.	Test the switch, if faulty, replace the power switch .
	Malfunctioning AC Power Cable (in chassis).	Measure the line voltage at input terminals on J1 of the power supply. If a line voltage is not present, replace the AC power cable.
	Malfunctioning power supply.	Check the power supply's output voltages at power supply's J2: Pins 2 and 4 are ground; Pin 1, + 15.0 ±.1V; Pin 3, +5.27 ±.05V; Pin 5, -15.0 ± .1V. If any voltage is incorrect, adjust or replace the power supply.

Situation	Possible Cause	Recommended Action
continued...	Internal cables loose, disconnected, or faulty.	Check and reseat all internal connections. Turn on and measure the power supply voltages at J4 on the ESM Main Board. If any voltage is incorrect, replace the DC power cable. Measure the power supply voltages at J4 on the EPM Main Board. If any voltage is incorrect, replace the I/F Cable.
	Malfunctioning ESM Display Board.	Remove the front panel connection to the ESM Main Board at J2 and replace with an unmounted ESM Display Board. If the power ON indicator lights correctly, replace the ESM display board.
No bar graph indication.	End Point Monitor Remote plugged into the End Point Monitor.	Verify that nothing is plugged into the ***Remote Display*** connector located on the rear of the End Point monitor.
	Malfunctioning power supply.	Check the power supply's output voltages at power supply's J2: Pins 2 and 4 are ground; Pin 1, + 15.0 ±.1V; Pin 3, +5.27 ±.05V; Pin 5, -15.0 ± .1V. If any voltage is incorrect, adjust or replace the power supply.
	Internal cables loose, disconnected, or malfunctioning.	Check and reseat all internal connections. Turn on and measure the power supply voltages at J4 on the ESM Main Board. If any voltage is incorrect, replace the DC power cable. Measure power supply voltages at J4 on the EPM Main Board. If any voltage is incorrect, replace the I/F Cable.

Situation	Possible Cause	Recommended Action
continued...	Malfunctioning connection between Front Panel receptacles and EPM Main Board.	Measure the resistance between the upper ***Bipolar Generator*** receptacle and the right-most ***Bipolar Accessory*** receptacle. Measure the resistance between the lower ***Bipolar Generator*** receptacle and the left-most ***Bipolar Accessory*** receptacle while pins 1 & 2 of J1, of the EPM Main Board are being shorted. If any of the above measurements is > 2 ohms, replace the front panel.
	Malfunctioning EPM Display Board.	Connect the electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacle using 2 banana cords. Short the ***Bipolar Accessory*** receptacle with another banana cord. Set the bipolar output power to approximately 3 watts. Remove the front panel connection to the EPM Main Board at J2 and replace with an unmounted Display Board. If the bar graph shows an indication when the electrosurgical generator is activated, replace the ESM display board.
	Malfunctioning EPM Main Board.	Connect the electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacle by using 2 banana cords. Short the ***Bipolar Accessory*** receptacle with another banana cord. Set the bipolar output power to approximately 3 watts. Connect a DC voltmeter across J3 pin 1 & 2. If the voltmeter does not show an indication when the electrosurgical generator is activated, replace the EPM Main Board.

Situation	Possible Cause	Recommended Action
No audible indication (no clicking), correct bar graph indication.	The ***Volume Control*** switch is in the wrong position.	Set the ***Volume Control*** switch to the up position, ***High***.
	Malfunctioning speaker, speaker ***Volume Control*** switch, and/or cable.	Measure the voltage between ground (- end of C6) and the end of R22 nearest the board edge. If it is < 4.8 V, replace the EPM Main Board (assuming the ESM Main Board is OK). Set the speaker ***Volume Control*** switch to ***High***. Remove the meter end of the lead connected to R22 and momentarily touch it to ground. Perform the above test for the ***Volume Control*** switch set to ***Low*** and again in ***Off***. If a click is not heard from the speaker while the switch is in either ***High*** or ***Low***, replace the volume control switch.
	Malfunctioning EPM Main Board.	Connect the electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacle using 2 banana cords. Short the ***Bipolar Accessory*** receptacle with another banana cord. Set the bipolar output power to approximately 3 watts and the ***Volume Control*** switch to ***High***. If a clicking is not heard when the electrosurgical generator is activated, replace the EPM Main Board.

Situation	Possible Cause	Recommended Action
"Fuzzy" Indication on the bar graph. When indicating near the high end of the current scale, the bars at the right end of the indication are neither fully on or off.	Faulty power supply.	Check the power supply's output voltages at power supply's J2: Pins 2 and 4 are ground; Pin 1, + 15.0 ±.1V; Pin 3, +5.27 ±.05V; Pin 5, -15.0 ± .1V. If any voltage is incorrect, adjust or replace the power supply.
	Internal cables loose, disconnected, or malfunctioning.	Check and reseat all internal connections. Turn on and measure power supply voltages at J4 on the ESM Main Board. If any voltage is incorrect, replace DC power cable. Measure power supply voltages at J4 on the EPM Main Board. If any voltage is incorrect, replace I/F Cable.
	Malfunctioning EPM Display Board.	Connect electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacle using 2 banana cords. Short the ***Bipolar Accessory*** receptacle with another banana cord. Set the bipolar output power initially to approximately 3 watts. Remove the front panel connection to the EPM Main Board at J2 and replace with an unmounted EPM display board. If the bar graph indicates correctly when the electrosurgical generator is activated and adjusted to cause a near full scale indication, replace the EPM display board.
	Malfunctioning EPM Main Board.	If the above steps have failed, replace the EPM Main Board.

Situation	Possible Cause	Recommended Action
Front panel display does not turn off when End Point Monitor Remote is plugged into rear connector.	Malfunctioning EPM Main Board.	Connect the electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacle using 2 banana cords. Short the ***Bipolar Accessory*** receptacle with another banana cord. Set the bipolar output power to approximately 3 watts. Remove the remote connector and short pins 6 & 7 in J3. If the front panel bar graph still shows an indication when the electrosurgical generator is activated, replace the EPM Main Board.
	Internal cables loose, disconnected, or malfunctioning.	Connect the electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacle using 2 banana cords. Short the ***Bipolar Accessory*** receptacle with another banana cord. Set the bipolar output power to approximately 3 watts. Remove remote connector and short pins 1 & 2 in the remote connector receptacle. If the front panel bar graph still shows an indication when the electrosurgical generator is activated, return the unit for repair.
	Malfunctioning End Point Monitor Remote unit.	Measure the resistance between pins 1 & 2 of the remote display's plug. If >2 ohms, replace the End Point Monitor Remote unit.

Situation	Possible Cause	Recommended Action
End Point Monitor Remote Display does not indicate when plugged into the AEM Monitor, and the front panel display works properly when the plug is removed.	Defective EPM Main Board.	Remove the remote connector. Measure the supply voltage between pins 7 (ground) & 4 of J3. Connect the electrosurgical generator bipolar output to the ***Bipolar Generator*** receptacles using 2 banana cords. Short the ***Bipolar Accessory*** receptacles with another banana cord. Set the bipolar output power to cause an indication in the upper half of the scale. Activate the electrosurgical generator and measure the voltage between pin 7 (ground) and pin 5 & 6 of J3. If the voltage difference is >0.1V and the supply voltage >5.20V, replace the EPM Main Board.
	Internal cables loose, disconnected or malfunctioning.	Remove the remote connector. Measure the supply voltage between pins 1 & 4 of the remote connector receptacle. Connect the electrosurgical generator's bipolar output to the ***Bipolar Generator*** receptacles using 2 banana cords. Short the ***Bipolar Accessory*** receptacles with another banana cord. Set the bipolar output power to cause an indication in the upper half of the scale. Activate the electrosurgical generator and measure the voltage between pin 1 (ground) and pin 2 & 3 of the remote connector receptacle. If the voltage difference is >0.1V and the supply voltage >5.20V, return the unit for repair.
	Defective End Point Monitor Remote unit.	If the above steps have failed, replace the End Point Monitor remote.